Fluctuation theory and exit systems for positive self-similar Markov processes

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Résumé en anglais	For a positive self-similar Markov process, X, we construct a local time for the random set, Θ, of times where the process reaches its past supremum. Using this local time we describe an exit system for the excursions of X out of its past supremum. Next, we define and study the ladder process (R, H) associated to a positive self-similar Markov process X, namely a bivariate Markov process with a scaling property whose coordinates are the right inverse of the local time of the random set Θ and the process X sampled on the local time scale. The process (R, H) is described in terms of a ladder process linked to the Lévy process associated to X via Lamperti's transformation. In the case where X never hits 0, and the upward ladder height process is not arithmetic and has finite mean, we prove the finite-dimensional convergence of (R, H) as the starting point of X tends to 0. Finally, we use these results to provide an alternative proof to the weak convergence of X as the starting point tends to 0. Our approach allows us to address two issues that remained open in Caballero and Chaumont [*Ann. Probab.* 34 (2006) 1012–1034], namely, how to remove a redundant hypothesis and how to provide a formula for the entrance law of X in the case where the underlying Lévy process oscillates.
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